Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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The loneliness pandemic: Loneliness and other concomitants of depression, anxiety and their comorbidity during the COVID-19 outbreak

1. Introduction

Since its outbreak, in December 2019, the coronavirus disease (COVID-19) has rapidly spread into a global pandemic. Many people infected with the coronavirus experience mild to moderate respiratory difficulties, and in extreme cases, serious illness and death (Lipsitch et al., 2020). Due to a lack of specific treatment, the swift spread of the pandemic has triggered various psychiatric symptoms such as depression and anxiety (Xiang et al., 2020). Previous studies showed that depression and anxiety were highly prevalent in pandemics, and tended to appear in comorbidity among SARS survivors (Mak et al., 2009). Therefore, these psychiatric problems and their comorbidity may be another result of the novel coronavirus outbreak. In many countries, the age benchmark of 60 was used to demark those at high-risk for COVID-19 complications (Murthy et al., 2020). Thus, our first goal was to compare psychiatric symptoms of depression, anxiety and their comorbidity between those at low- and high-risk for COVID-19 complications. Our second goal was to address the psychiatric effects of social-distancing (Mizumoto and Chowell, 2020), a policy adopted in the absence of specific medical treatments. A central potential outcome of such social-distancing policy is loneliness, defined as a discrepancy between desired and perceived social relationships (Jeste et al., 2020). Loneliness is linked with a myriad of deleterious physical and mental consequences (e.g., Heinrich and Gullone, 2006). To the best of our knowledge, the present study is among the first to evaluate COVID-19 related psychiatric symptoms of depression and anxiety, and their comorbidity in a Western society (Israel), where restrictive social-distancing has been employed.

2. Methods

Using the Qualtrics web-based public platform, we collected data (March 15-April 1st) across Israel using a snowball design, via social-media platforms. On the last day of data collection, 6902 people in Israel tested positive for COVID-19, 241 recovered and twenty-five had died. Participants (n = 1059, average age = 46.21 ± 16.49, range 18–100) electronically signed an informed consent. Most were women (n = 798, 75.2%), married/cohabitating (n = 762, 71.8%) with tertiary-education (n = 805, 76.1%). Participants completed a demographic questionnaire, including age, gender, marital-status, education, diagnosis of chronic medical conditions related to increased risk of death due to COVID-19 complications [yes/no] and self-rated health. Exposure levels to six COVID-19 related risk situations (e.g., self-isolation, knowing someone in isolation) and change in eleven pandemic related behaviors (e.g., hand washing) were also queried. In addition, participants were asked to report how the COVID-19 outbreak affected loneliness levels (3-items, $\alpha = 0.870$; Hughes et al., 2004), depression (PHQ-9, $\alpha = 0.860$; Spitzer et al., 2006), and general anxiety (GAD-7, $\alpha = 0.932$; Kroenke et al., 2001). Ethical approval was received from the Institutional Review Board at the authors' university.

3. Results

Age was negatively correlated with PHQ-9 and GAD-7 ($r = -0.25$, $r = -0.21$, respectively, p's < 0.000), and loneliness was positively correlated with PHQ-9 and GAD-7 (r = 0.34, r = 0.29, respectively, p's < 0.000). Finally, PHQ-9 and GAD-7 were strongly correlated (r = 0.74, $p < .000$). Using the accepted cutoffs for PHQ-9 (≥ 10; n = 153, 14.4%) and GAD-7 (≥ 10; n = 201, 19.0%), we found that a higher percentage of participants younger than 60 reported symptoms above the cutoffs for both PHQ-9: $X^2(1058,1) = 10.36$, $p < .005$, and GAD-7: $X^2(1056,1) = 28.75$, $p < .000$. Further, a higher percentage of women reported symptoms above the PHQ-9, $X^2(1061,1) = 4.89$, $p < .05$, and GAD-7 cutoffs, $X^2(1059,1) = 7.15$, $p < .01$. Marital-status distribution did not co-vary with cutoff score distributions for either PHQ-9 and GAD-7. A higher percentage of participants without academic education reported symptoms above the PHQ-9 cutoff, $X^2(1058,1) = 9.07$, $p < .005$, but not for the GAD-7 cutoffs. Finally, no differences were found between diagnosis of chronic medical conditions (related to increased risk of death due to COVID-19) and cutoffs for PHQ-9 and GAD-7, ($X^2(1043,1) = 0.54$, $p = .46$; $X^2(1041,1) = 2.65$, $p = .11$, respectively). When examining comorbidity, 41(3.9%) participants reported suffering only from PHQ-9 symptoms above the cutoff, 89 (8.4%) suffering only from GAD-7 symptoms above the cutoff and 112 (10.4%) displayed symptoms above the cutoff for both disorders.

Univariate and multivariate logistic regression analyses showed that after entering demographics, health-related factors, exposure to COVID-19 related events, behavioral change and loneliness; loneliness was the most prominent risk factor for depression and anxiety (PHQ-9: $OR = 1.62$, 95%CI: 1.35–1.94; GAD-7: $OR = 1.61$, 95%CI: 1.36–1.90). Moreover, the results showed (see Table 1) that relative to those with low loneliness, those with high loneliness were 82% more susceptible to suffer from depression-anxiety comorbidity due to the coronavirus outbreak ($OR = 1.82$, 95% CI: 1.47–2.27).

4. Discussion

The first main finding is somewhat counterintuitive, indicating that

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Table 1
Univariate and multivariate logistic regression analyses.

	Univariate Logistic Regressions, Likelihood of Diagnosis (separately) Relative to No Diagnosis		Multivariate Logistic Regression,Likelihood of Diagnosis Relative to No Diagnosis		
Variable	PHQ −9 cutoff, (141 vs. 882) OR (95% CI)	GAD-7 cutoff, (190 vs.832) OR (95% CI)	PHQ −9 cutoff, (40 vs.792) OR (95% CI)	GAD-7 cutoff, (89 vs.792) OR (95% CI)	Comorbidity cutoff, (101 vs. 792) OR (95% CI)
Age	.972 (0.959–0.985)***	.961 (0.948–0.974)***	.980 (0.957–0.1.004)	.957 (0.939–0.974)***	.962 (0.946–0.978)***
Gender[a]	1.300(0.811–2.084)	1.261 (0.825–1.927)	1.389(0.614–3.141)	1.265 (0.705–2.268)	1.303 (0.748–2.270)
Marital status[b]	1.590(1.018–2.483)*	1.665 (1.108–2.501)*	1.025(0.492–2.134)	1.316 (0.770–2.249)	2.066 (1.203–3.548)**
Education[c]	.843 (0.685–1.038)	1.137 (0.920–1.406)	.691 (0.503–0.950)*	1.306 (0.943–1.808)	.977 (0.759–1.258)
Self-rated health[d]	.767 (0.613–0.961)*	.689 (0.560–0.848)***	.994 (0.647–1.527)	.741 (0.560–0.981)*	.649 (0.501–0.841)**
Chronic medical conditions[e]	1.025 (0.558–1.882)	.856 (0.487–1.503)	.838 (0.262–2.678)	.643 (0.278–1.485)	1.016 (0.508–2.031)
Exposure to COVID-19 related situations	.965 (0.807–1.154)	.942 (0.801–1.108)	.999 (0.735–1.359)	.947 (0.761–1.179)	.935 (0.757–1.154)
Behavioral change	1.069 (0.979–1.167)	1.143 (1.051–1.243)**	1.057 (0.911–1.226)	1.195 (1.060–1.346)**	1.107 (0.996–1.230)
Loneliness	1.618 (1.346–1.944)***	1.606 (1.355–1.903)***	1.468 (1.072–2.011)*	1.465 (1.163–1.845)**	1.823 (1.467–2.266)***

* $p < .05$.
** $p < .01$.
*** $p < .001$.
Note: Total $N = 1059$. [a] = woman. [b] = currently married, or living with a partner. [c] = six education levels from 1) preprimary education to 6) tertiary education. [d]from 1) not good at all to (5) very good. [e]Yes. No significant differences were found when the multivariate analysis was run without the no-diagnosis group.

old age as an actual risk for COVID-19 complications was negatively related with depression and anxiety. Moreover, neither the suffering from chronic medical conditions (related to increased risk of death due to COVID-19) nor exposure to COVID-19 related risk situations were link to higher risk for depressive and anxiety symptoms. Critically, for age, this was even reversed, namely, adults above 60 who are at higher risk for COVID-19 complications, actually displayed greater resilience to psychiatric disorders associated with the COVID-19 crisis. Such results can be viewed in light of older adults typically displaying lower reactivity to stress, exercising more effective emotional regulation, having greater experience with being alone and with life-threatening medical situations, and thus were perhaps less sensitive (Losada-Baltar et al., 2020). The second main finding reveals that loneliness, due to the social-distancing policy, was the main risk-factor for depression, anxiety and especially their comorbidity. In line with previous studies linking loneliness with a range of deleterious physiological and psychiatric outcomes (Heinrich and Gullone, 2006; Shrira et al., 2020), the results underscore that loneliness at such a time (regardless of the social-distancing policy) bears a notable psychiatric toll. Accordingly, policy makers and mental health practitioners need to stress the importance of safe social interactions (Jeste et al., 2020). Although this preliminary study is limited by its cross-sectional and self-report design, which may affect its generalizability, and despite the fact that individuals' psychiatric history was not assessed, it offers pioneering insight into negative psychiatric outcomes linked with the COVID-19 pandemic. Further, this study is based on a relatively large sample and was conducted during the pandemic, thereby carrying important information in terms of the special psychiatric attention warranted to the more vulnerable younger-adults, who are at lower risk of COVID-19 complications.

Author statement

All authors took part in the design of the study and building the questionnaire and in the conceptualization of the study. Y. Palgi analyzed the data. Y. Palgi, and A. Shrira contributed the methodological parts, and Y. Palgi provided the literature research. All authors contributed to and have approved the final manuscript.

Declaration of Competing Interest

None.

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